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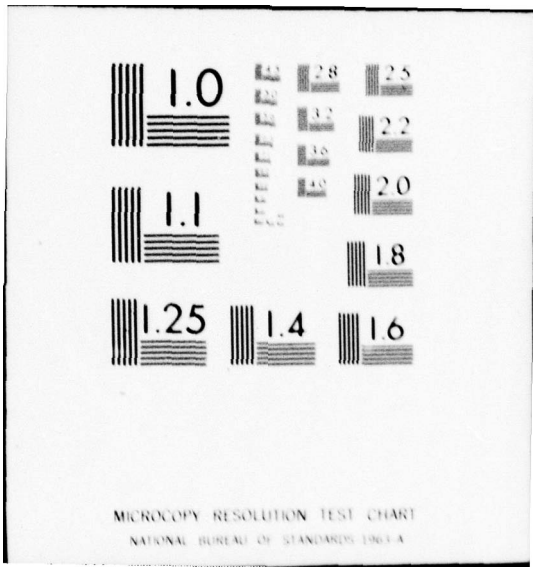
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(10) Michael D. Hite
Captain USAF

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WEAPON SYSTEM ACTIVATION: THE IMPACT OF PARALLEL SITE ACTIVATIONS

THESIS

Presented to the Faculty of the School of Engineering

of the Air Force Institute of Technology

Air University

in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

by

Michael D. Hite

Captain USAF

Graduate Systems Management

December 1977

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This thesis is my attempt to add to the fairly small collection of written knowledge about the site activation process. I must thank Major Claude Kincade for his personal interest in the thesis requirement of AFIT and his willingness to assist students. This topic was generated through his efforts and concern. I hope this report might be of some value to project managers of future site activations.

I would also like to express my thanks to Major Frederic Abrams and Captain Michael Hembrough for thesis assistance in the information gathering process.

My greatest indebtedness for this effort is to my wife and family, who have made the largest sacrifices over the past nine months.

Michael D. Hite

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

With the development of the F-16 and other low cost, high production weapon systems, the need to activate higher numbers of sites at one time becomes a reality. It also generates new management problems. An historical examination of past activation efforts, primarily the F-15 and A-10, was combined with a review of current management literature to evaluate the problems. A project management structure is proposed to handle simultaneous activation. This structure is similar to those of past systems, but with the addition of another level of management to supervise the overall activation effort. The "Manager of Projects" role has been filled in the F-16 effort by the Director of Deployment. While the F-16 program seems successful, complete validation can come only when the F-16 effort is concluded.

WEAPON SYSTEM ACTIVATION: THE IMPACT OF PARALLEL SITE ACTIVATIONS

I. INTRODUCTION

As a response to ever changing military threats, the United States Air Force (USAF), through the Air Force Systems Command (AFSC), is constantly seeking new means of providing for the national defense. The Aeronautical Systems Division (ASD) of AFSC is responsible for the development and acquisition of new weapon systems. The acquisition process consists of five functional periods that take the new weapon system from the drawing board to a state of operational readiness.

Review of the Acquisition Life Cycle

Conceptual Phase. During the conceptual phase, the request for a new system is identified and reviewed to develop alternative concepts that may fulfill the requirement. Concepts included are cost, schedule, plus procurement, support, and estimated operational parameters.

Validation Phase. During the second phase, validation, the developmental concepts are restructured and refined to better define those characteristics necessary to fulfill the requirements of the conceptual phase. Limited hardware may be developed, tested, and evaluated. Prior to the beginning of the validation phase, the Defense Systems Acquisition Review Council (DSARC) must approve the processes of the conceptual phase. Otherwise, the project will not proceed beyond this first phase. At the conclusion of the validation phase, the DSARC will approve or disapprove the choice of alternatives and authorize full scale development.

Full Scale Development Phase. During full scale development, the validated weapon system and related support equipment are designed, fabricated, tested, and evaluated. It is during this phase that the weapons system and support equipment for that system appear in near final form. If the DSARC feels that the system satisfies the requirement and can meet any constraints that have been imposed, approval is given to proceed with production.

Production Phase. Production involves the manufacture of the weapon systems and support materials. Test and evaluation continue with changes made to baseline equipment as necessary. The production phase will continue until such time as all required aircraft and associated equipment are fabricated.

Deployment Phase. During the deployment phase, the weapons system becomes operational. Deployment begins with the first arrival and acceptance of a new system at the user facility and will continue as long as the system remains operational. The first delivery is normally made prior to the end of production; therefore, the production and deployment phases will normally overlap.

The emphasis of this thesis will be with the deployment phase of acquisition. It is during this final phase that the results of the entire acquisition process are ratified by actually placing the new weapon system into an operational environment. Procedures for turnover to the operating command are applied and aggressively pursued.

Major Elements of Deployment

Deployment is not a single activity, but actually a unification of several major events. These events include turnover, transition, operational test, and evaluation among others.

> Turnover occurs when the operating command accepts responsibility for the operation and maintenance of the first operating unit of a new or modified system/equipment or system segment, and includes related property accountability/inventory transfer of the first and subsequent operating units or segments (Ref 29:5-7).

Operating commands normally include Tactical Air Command (TAC), Military Airlift Command (MAC), Strategic Air Command (SAC), United States Air Forces Europe (USAFE), etc.

Transition is formally referred to as Program Management Responsibility Transfer (PMRT) and is the formal termination of AFSC program management responsibility with its related engineering, procurement, and integrated logistics support. Air Force Regulation 800-4 refers to transition as

> That point in time when the designated Supporting Command accepts program management responsibilities from the Implementing Command. This includes logistic support and related engineering and procurement support (Ref 30:1).

The supporting command is normally Air Force Logistics Command (AFLC).

Operational test and evaluation is conducted during the deployment phase to "determine the operational capabilities of the system and develop the most effective operational tactics, techniques, doctrines, and standards and prove the operation and maintenance concepts to the operating command" (Ref 29:5-7). The overall purpose of deployment is to bring a new system into the operational inventory, or to replace an older system and thus improve the capability of that unit. The first process is properly called Introduction while the second is Conversion. Activation is that portion of conversion concerned with providing an operational unit a new weapon system and entails essentially the same type of activities as does introduction.

Within the Deployment phase, activation--the process of delivering and making operational new weapon systems--becomes an important focal point

and one of increased managerial interest. During this phase, all of the elements of the acquisition effort must be joined to fulfill the need identified during conceptualization. This requires that the development of the weapon system, including all subsystems and all arrangements for support of the system be confluent to make the system useable. Because the deployment of a new system is so important, the efficiency of activation becomes a visible measure of overall program effectiveness.

As weapon systems have become more costly, each program is more closely scrutinized and more pressure is brought to bear for smooth activation into an operational status.

Statement of the Problem

Problem Background. The F-16 Multinational Fighter Program has initiated many new concepts in acquisition management. The program entails co-development and production of the F-16 weapons system by five different nations: the United States, Belgium, Denmark, Holland, and Norway. The advantages of such a program include strengthened international alliances through increased interdependence, improved international trade, and enhanced standardization of the North Atlantic Treaty Organization (NATO) force. With these advantages come certain problems including different philosophies of doing business, industrial output efficiency, stability of currency plus basic variances in philosophical and social elements--all presenting new managerial headaches.

The multinational production also impacts deployment and, specifically, site activation. With five nations committed to the development of the F-16 and an increased third country interest, the production rates for F-16 aircraft will be the highest of any in recent history. The staff of Aviation Week and Space Technology reported the total demand for western

fighter aircraft may reach 6,000, including the General Dynamics F-16, Grumman F-14, McDonald Douglas F-15, McDonald Douglas/Northrup F-18, and Dassault Mirage 2000. Nine different countries have indicated an interest in nearly 2000 F-16's alone (Ref 31:73). To match such demand, production at General Dynamics and associated European manufactures may reach as high as 50-55 aircraft per month by 1983 (Ref 32:11). With such high production rates, it becomes more difficult to execute the necessary activation process within the allowable time constraints.

The Problem. The compression of site activation schedules due to increased production rates adds new dimensions to the deployment management challenge when compared to the slower paced activities of the past. The problem can best be expressed in three elements:

1. To what degree are prior activation management techniques still applicable?
2. Which management techniques must be altered due to the higher frequency of activation? Why?
3. What management alternatives would be appropriate in 1 and 2 above?

Statement of Objectives and Limitations

The intent of this thesis is to identify problem areas in the management of multiple site activations. Due to the time available for research, this effort will be limited to fighter type aircraft with the assumption that transfer to other aeronautical systems could be made with minimal adjustment. Other assumptions will include:

1. Site activation is the most crucial element of the deployment phase and actually represents the culmination of the acquisition process.
2. The effects of disposition of older systems do not directly impact upon the activation and will not be treated in this effort.

3. Any guidance provided by this thesis will refer to the overall process of site activation. Those items that would deal with the activation of a unique site and do not impact on the overall process will not be referenced. Such unique activities are assumed to be unchanged by whether or not the site is a part of a single or multiple activation.

4. The F-16 site activation will be representative of a typical multi-activation effort.

Research Methodology

Applicable managerial techniques and philosophies for multiple site activations will be developed by evaluating current activation management practices and available management literature in light of the future impact of activation schedule compression. To establish current activation practices, an historical overview of site activations will be presented with emphasis on time elapsed during and between activations plus the management practices utilized. The activations of the F-15 and A-10 aircraft will be highlighted as current examples.

Potential management applications will be proposed from a literature survey of current management philosophies. This combined with the analysis of techniques of past site activations will provide the basis for proposed management of future site activations involving simultaneous activations.

Finally, to provide a comparative evaluation of the proposed course of action, the F-16 site activation program will be tracked during the first stages of planning and development. Inasmuch as the F-16 program is dealing with higher aircraft delivery rates and higher frequency activation, it will provide a limited means of validating or invalidating the proposed management techniques presented in this thesis.

Thesis Organization

Chapter Two includes a history of site activation up to but not including the F-16 aircraft. Current policies of site activation are presented with emphasis on those weapon systems activated in the last five years.

Chapter Three is a survey of relevant management literature. An effort was made to emphasize those management schools of thought and theories that could possibly impact on site activation projects and projects containing simultaneous or multiple activities.

Chapter Four provides proposed management techniques based upon the information presented in chapters Two and Three. Included are advantages, disadvantages, and justification for each proposal. Chapter Four also presents the F-16 program as it has developed thus far and includes a comparative analysis between that program and the proposals presented earlier in the chapter. It is recognized that a complete evaluation of the F-16 project will not be possible until turnover has actually occurred, but sufficient progress has been made to aid the evaluation of suggestions in this thesis.

The final chapter includes summary remarks, conclusions, and recommendations that may assist future activations or research efforts in this area.

II. HISTORICAL OVERVIEW OF SITE ACTIVATION

Introduction

Any attempt to develop the management techniques suggested in Chapter One would be foolhardy at best if no analyses of previous experiences in the subject area were conducted. This chapter is intended to present an historical overview of site activation and the Site Activation Task Force (SATAF) in order to take advantage of past activation experiences and lessons learned. This effort is not intended to be an historical record, but an indicator of how site activation has developed and why it is in the state it is in today.

A significant portion of this historical work was accomplished by Major Frederic Abrams and his efforts are acknowledged herein. In his masters thesis, "Weapon System Activation: The Process, Problems, and a Management Approach" (1974), he discussed historical aspects which go beyond the scope of this effort, but might be beneficial for more extensive research.

Early Activation History

The most significant feature of the early history of site activation is that there is apparently no history at all. In stating his purpose for writing his thesis, Abrams addressed two specific problems:

1. There is insufficient guidance available on the proper conduct of deployment, and specifically activation activities.

2. There is not a concise recording of either the problems historically encountered in activation programs or the lessons that have been learned (Ref 1:16).

A search of the Defense Documentation Center verified this lack of information, prior to 1974. In an attempt to identify historically encountered

activation problems, Abrams had to resort to long hours of examining the unit histories retained at the Albert F. Simpson Historical Research Center at Maxwell AFB, Alabama. When asked whether the thousands of documents he reviewed provided any knowledge of the form of management utilized in site activation, Abrams replied that his study had revealed "no insight as to the management techniques used" (Ref 2). In essence, no historical data has been available from which an activation manager might draw until 1974 and the beginning of the F-15 project which will be discussed in a subsequent section of this chapter. In 1974 Abrams completed his thesis and was assigned to the F-15 project office. There he continued development of his concepts while working with the F-15 deployment program.

Current Efforts

To determine the state of the art in site activation, two weapons systems, the F-15 and the A-10, will be studied as typical current developments in this area. The F-15 was selected because it is a follow-up to Abrams' work. Additionally it was the first such system to utilize the Site Activation Task Force (SATAF) to bring about activation. Both the A-10 and the F-15 are new weapon systems with activations coming after 1974. The A-10 has also utilized the SATAF, but somewhat differently than the F-15.

At this point, some discussion of the SATAF, what it is and where it came from, is appropriate. According to AFSC/AFLC regulation 800-11, the mission of the SATAF is to "activate, alter, or convert a site at a specific location according to the program management plan (PMP) and directives issued by the responsible PM [program manager]" (Ref 28:2). However, this regulation was established for the activation of missile systems and the

SATAF, "equivalent to a field office of a program office . . . " was used to manage Air Force and contractor participants in site activation (Ref 28:2). As the concept has developed in current use, the SATAF has become a forum to provide communication, coordination, and a catalyst to resolve site activation problems. Membership of the task force comes from the program office, the contractor, and involved support and user agencies. This development of the SATAF evolved during the development of the F-15 project and is summarized in the following paragraphs.

F-15 Site Activation Development. Initial efforts in the F-15 SPO centered around the development of a Turnover and Transition Working Group in accordance with Air Force Regulation 800-4. As work progressed, difficulties began to abound. As Abrams pointed out,

> Those involved at the F-15 SPO generally felt that there was a definite lack of guidance available for accomplishing the task ahead of them. The one particular area where no other SPO seemed to have recorded what they did was in the organization of the Turnover and Transition Working Group, the F-15 SPO project officers could find no evidence that written turnover procedures had ever been produced for an aeronautical system (Ref 1:106).

While the F-15 activation project was struggling with its organization problems, Major General Benjamin N. Bellis, System Program Director, made the decision to utilize the Site Activation Task Force for aircraft systems. This was his reasoning:

> During the early and mid-1950's, I was assigned to the MATADOR and MACE Missile programs. A key deficiency in the overall management of these programs was the lack of a disciplined program for phasing this new operational system into the active inventory. Later when I was assigned to the THOR and ATLAS Ballistic Missile programs, we had similar deficiencies in the early operational activation efforts. In order to correct the Ballistic Missile, Site Activation Task Forces were organized and activated at each of the operational sites. The operational site activities, in essence, had the responsibility for "producing" operational sites. Their efforts were primarily production oriented and their daily activities involved coordinating schedules, making certain that the various parts and pieces of

> the program were coming together and as they came together they logically fit into satisfying the requirements of the operational system. That effort has continued to this day and is still used in a very successful manner in activating and even in modernizing MINUTEMAN operational sites. The activation of aircraft squadrons is not all that different. It involves resources (both manpower and hardware), it involves time phasing and it involves money. The various training programs for the operation and maintenance people have to be properly phased so that the training program graduates are available at the proper time and at the proper numbers and with the proper skill levels. The Air Force Base being activated must be prepared in proper time phasing for the removal of the old equipment and in the installation of the new. Any construction work must be properly budgeted, procured and constructed. The new system being introduced must be complete. This includes not only the prime mission equipment such as an airplane but also the aerospace ground equipment, spares, operating and maintenance technical data, simulators, and of course the operating and support planning of how the operational unit is to perform (Ref 7).

Having decided to use the SATAF, representatives from the F-15 SPO reviewed activations of other systems (F-111, F-4, F-5, and C-5) only to find no guidance available from these systems. Some assistance was found in the Initial Operational Capability Working Group used by the AGM-69 (SRAM) SPO. This working group addressed many of the same problem areas faced by the F-15 SATAF. Information from the SRAM SPO and AFSC/AFLC Pamphlet (now regulation) 800-11 led to the initial construction of the F-15 SATAF.

SATAF Membership. To be an effective forum, each organization that was to play a significant role in the activation must be represented. During the first SATAF formed by the F-15 SPO to activate Luke AFB, the following organizations were represented:

1. The F-15 SPO--the chairmanship and basic organizing roles were filled by the SPO.
2. Tactical Air Command--representatives from headquarters level to the individual unit being activated were present.
3. Air Force Logistics Command Air Material Area (now Air Logistics Center).
4. Air Training Command.

5. McDonald Aircraft Corporation--aircraft contractor.

6. Pratt and Whitney Aircraft--engine contractor.

7. The Air Force Plant Representative Office at the two contractor facilities.

8. Air Force Flight Test Center.

A Turnover Plan. While the SATAF was being developed, an overall plan addressing the activation was being drafted in the SPO. Such a plan was thought to be essential because "it establishes in a single document all the aircraft and related support items required for the F-15 program" (Ref 26:1). The final version of the document was apparently the first of its kind relating to aeronautical system turnover. In a transmittal letter that accompanied the plan, Major General Bellis stated that:

> Experiences from prior systems (F-111, F-4, etc.) reveals that turnover of aircraft and related support equipments and facilities was accomplished with no overall plan for accomplishment which led to considerable unnecessary difficulties (Ref 8:1).

Details for the development and more specific contents of this plan are not relevant to this study but are available in Abrams thesis.

SATAF Activities. Typical SATAF Activities comprise three days of meetings. Day One is an introductory session with all participants outlining procedures, requirements, and various agenda items to be covered. On the second day, the session is conducted within specialized working groups that are concerned with the different problem areas (spaces, facilities, training, etc.). These activities are not limited to the second day only, but generally use a portion of the first and third days. For the F-15 activations, these workshops were initially conducted simultaneously. With the advent of more difficult European activations, these meetings were changed to a sequential agenda to allow the individuals involved to participate in a larger number of activities. All F-15 SATAF

working groups now meet in sequential order. The final day activities include a review of working group activities and the establishment of action items to be resolved in the future. In order for a specific SATAF meeting to be a success, all participants must accept the responsibility for preparation prior to each meeting.

On occasion, the progress of the SATAF is halted by inertia which cannot be resolved by normal diplomacy. Such situations arise due to conflicts in manning or material accessments and may be unresolvable in the authority level of the SATAF. To counter such difficulties, the commander of the Air Force Systems Command Aeronautical Systems Division proposed the formation of a General Officer Steering Group (GOSG). This group, consisting of general officers from each of the four major commands involved, provided the authority base to resolve problems that remain unsettled at the SATAF level.

> The decision to form this group stemmed from a need to bring top level authority to bear in intercommand problem resolution . . . Since the SATAF was to serve as a catalyst for action in the functional areas, some authority to assign responsibilities was required and the steering group was formed to obtain that authority (Ref 1:133).

The functioning of the F-15 SATAF is essentially unchanged in concept. Major Abrams functions as the SATAF chairman in all activations and is the essence of the F-15 site activation corporate memory. The results of each SATAF meeting are documented in comprehensive minutes which Abrams feels should be published immediately, adding to the credibility of the process (Ref 2). The minutes are normally prepared prior to departing the meeting site. As the SATAF organization progresses from one site to another, as much of the intercommand cadre as possible is retained to maintain continuity. Again, the SATAF chairman is the pivotal element for all activations. To date, four is the largest number of sites to be in activation at one

time, varying from just beginning to near completion. Follow-up to the F-15 SATAF activities is provided by a SPO liaison office that tracks final action items and provides a TDY team to the activation site if requested by the using organization.

Abrams has set as a goal of site activation the intention that no problem be encountered more than one time. He feels that the SATAF allows him to accomplish this and has made the following observations:

> Generally, the problems of activation are being recognized earlier in the F-15 program than has historically been the case. In many cases the SATAF has indicated action to expedite decisions and hence eliminated a problem caused by delays. In situations where problems cannot be eliminated the SATAF has, because of early problem recognition, been able to formulate alternate procedures to lessen the impact of the problem. There are, of course, some problems which will have significant impacts, but the number of these appears to be much lower than historically experienced (Ref 1:177).

A-10 Site Activation Development. The course of development of the A-10 site activation project was not unlike that of the F-15. The initial action of the A-10 project personnel was to investigate guidance available and what had been accomplished by other organizations. This procedure brought about the only expected results--the former was of little or no assistance while the latter was non-existent except for the experience of the F-15. Based upon this and the fact that the F-15 project had been successful, the A-10 site activation effort was patterned heavily after that of the F-15.

The A-10 SPO has adopted wholeheartedly the SATAF concept of management for site activations. Major Fred Ayers, project officer, commented that there "isn't any other way than SATAF" (Ref 5). After several activations, some significant differences in deployment techniques have developed that make the A-10 process unlike that of the F-15. These are discussed in the following paragraphs.

Perhaps the most significant variation of the A-10 project from the F-15 is not a variation, but a continuation of simultaneous working group meetings while the F-15 managers have changed to sequential meetings. According to Major Ayers, this allows the SATAF schedule to be compressed into two days or less under normal conditions. The compression is the result of not having to wait for one workshop to end before another begins. Where there is a need for individual participants to be present at more than one working group meeting, a physical capability of moving from one meeting to another is provided by having all sessions meeting in one facility. This also allows the occasional combination of groups to resolve common difficulties.

Another difference between the procedures used by the two project managers exists because Major Ayers and his staff did not feel the compulsion to provide immediate publication of the SATAF minutes that the F-15 group felt. More important, he said, was the insistence that nothing in the minutes be altered, added, or deleted after the final session (Ref 5). This was deemed important because the minutes would become the working papers for future action items.

The SATAF working group utilized by the A-10 varied somewhat from those of the F-15, but that is as expected because of the different roles and capabilities of the weapon system. Those included in the A-10 are:

1. Planning/Programming
2. Aircrew Training
3. Support Equipment
4. Spares/Supply Support
5. Facilities
6. Tech Orders
7. FOT & E Support

FOT & E Support is peculiar to the A-10 program. These groups resolve problems contained within their sphere of influence and are responsible for presenting problems in that area, which involves other working groups, to the SATAF for resolution at that level. The A-10 SPO has encouraged the chairmanship of these working groups to come from functional agencies other than the SPO, while maintaining SPO representation within the interest level of the other SATAF representatives in the proceedings.

Other elements of the A-10 site activation program are essentially the same as that used by the F-15 SPO. Both feel that the SATAF is an effective means of site activation and offer no alternatives. Both have utilized a General Officer Steering Group to provide the necessary authority base for the resolution of differences that must be taken above the SATAF level. The A-10 project manager accepts the GOSG as more of a matter of course than did those in the F-15 program office.

While both the F-15 and A-10 project managers turned to the prior experience of other weapon systems to determine how to accomplish site activation, they also referred to the available official publications and regulations. Those publications written at the Air Force level, primarily Air Force Regulations 800-2 and 800-4, expressed only the vaguest references to the overall responsibilities of system deployment. More specific information is contained in Air Force Systems Command Pamphlet 800-3. The overall desire of the deployment effort is expressed in this statement: "Overall, the Deployment Manager must integrate the efforts of, and provide assistance to, those MAJCOM's that have the responsibility to support and ensure the success of the deployment" (Ref 27:21-1). The pamphlet also indicates that the SATAF is an appropriate and effective way to achieve the goal.

Air Force Systems Command/Air Force Logistics Command Regulation 800-11 directly addresses the subject of the Site Activation Task Force, but, as

noted earlier, this reference is in a somewhat different context. Still, segments of the regulation have application to SATAF management as utilized in the activation of aeronautical weapon systems.

Overall, the corporate memory of site activation has grown noticeably since 1974 and the writing of Major Abrams' thesis. History has been a good teacher for those involved in the F-15 and A-10 activation process and surely their efforts will be monitored and reviewed by those who activate systems in the future.

III. MANAGEMENT REVIEW

Having reviewed the historical management philosophies of site activation, this chapter will be an attempt to identify management concepts that are available to the managers of future activations, primarily those involving multiple or parallel deployments. Essentially a literature review, this chapter will briefly identify initial management efforts, relate current management theory and philosophies, and conclude with a more in-depth discussion of project management. A complete review of management literature is certainly beyond the scope of this effort and no attempt has been made to be all inclusive. A general discussion of basic management concepts is presented with emphasis placed upon those items most directly affecting the subject matter of this thesis. Due to the nature of this subject, an expanded discussion of project management concludes the chapter.

What Management Is

An attempt to define something like management generally uncovers as many definitions as there are authorities that write about the subject. The very brief definition offered by Robbins, ". . . the universal process of efficiently getting activities completed with and through other people," stands in marked contrast to that of Koontz and O'Donnell:

> Managing is defined here as the creation and maintenance of an internal environment in an enterprise where individuals, working together in groups, can perform efficiently and effectively toward the attainment of group goals. Managing could, then, be called "performance environment design" (Ref 23:15) (Ref 17:1).

A third definition by Terry is probably representative of the majority currently in use:

> Management is a distinct process consisting of planning, organizing, actuating, and controlling, performed to determine and accomplish stated objectives by the use of human beings and other resources (Ref 25:4).

It becomes evident that certain elements exist in each definition, regardless of the eloquence or length of a particular definition. Generally, management involves itself with getting individuals to accomplish some task(s) in order to achieve some predetermined goal. While the manager's primary resources include other people, he also utilizes capital goods, raw materials, information, money, etc., to attain the preplanned objectives. Terry's definition indicates that these resources are manipulated by the manager through four basic functions: planning, organizing, actuating, and controlling. This process is shown graphically in Figure 1.

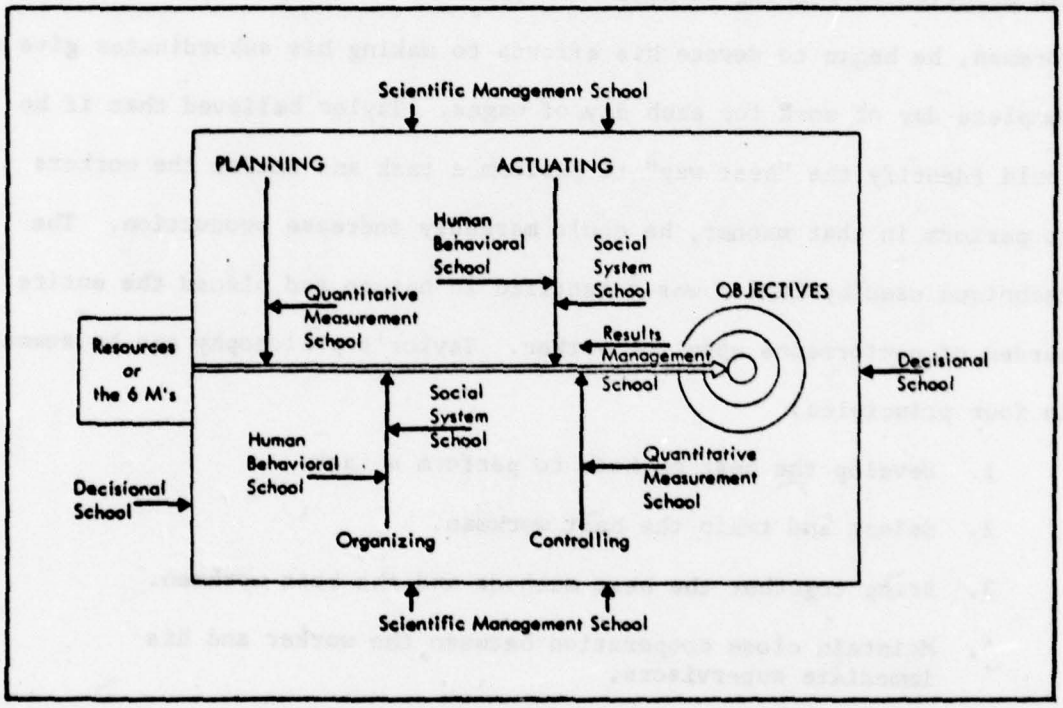

Figure 1. Planning, Organizing, Actuating, and Controlling in the Management Environment (Ref 25:92).

The functions of planning, organizing, actuating, and controlling appear frequently in management literature, although the exact words may differ. Directing is often substituted for actuating, staffing is sometimes inserted after organizing, and so on. Nevertheless, the meaning is essentially the same.

With a basic understanding of what management is, attention should be focused upon the historical elements of where modern management came from.

No doubt the earliest forms of management were found in the early civilizations of Mesopotamia, Greece, Rome, and different Biblical references, but it was not until the nineteenth century that management was actually studied and described. The industrial revolution had presented the world with a new situation--organizations of people working together to achieve a common goal through individual tasks. Frederick W. Taylor (1856-1917) had experienced working in America's youthful industry. Upon becoming a foreman, he began to devote his efforts to making his subordinates give a complete day of work for each day of wages. Taylor believed that if he could identify the "best way" to perform a task and entice the workers to perform in that manner, he could markedly increase production. The technique used by Taylor was scientific in nature and placed the entire burden of performance upon the worker. Taylor's philosophy can be summarized in four principles:

1. Develop the best methods to perform a task.
2. Select and train the best workman.
3. Bring together the best methods and the best workmen.
4. Maintain close cooperation between the worker and his immediate supervisors.

He believed in a "no work, no pay" concept and consequently had difficulty retaining employees. One major fact still remained--an attempt to improve the management of operations had been started. The beginnings of modern management had begun.

During the 1930's, Elton Mayo experimented with the human relations aspect of management. His hypothesis was that a happier worker would be

a more productive worker. Working in the Hawthorne plant of General Electric, he varied working conditions of a group of workers to see if there was a corresponding change in production. The unexpected results were that there was an increase in production regardless of how the work environment was altered. The key element proved to be the increased concern and interest the managers exhibited toward the workers in the experimental group. It is now accepted that human resources are not merely additional capital goods, but require special human considerations to elicit their greatest productivity.

The scientific techniques were among those brought together in the universalist thinking of a Frenchman, Henri Fayol. Though Fayol was a contemporary of Taylor, it was not until the 1940's that his work became widely studied. In addition to looking at the performance of the worker, Fayol concentrated on the actions of the managers as well. His effort dealt with the whole organization and tended to be more deductive and less inductive. Like Taylor, Fayol tended to ignore the emotional needs of the worker.

Schools of Management Thought

From these beginnings, a number of schools of management thought have emerged. Different practitioners have used each or combinations with varying degrees of success. Several examples follow.

Management by Custom. The management by custom school is built around the assumption that the future will be essentially the same as the recent past. Because of this, management should be guided by tradition with little change or innovation. In extremely stable organizations, this line of thinking can produce some success, but it is extremely limited in an ever-changing environment.

Scientific Management School. Taylor laid the groundwork for the scientific management school. Using controlled experimentation, sequential testing, and similar techniques, the scientific manager attempts to identify causal relationships within the work environment. The scientific manager also believes that "the use of thorough investigation, controlled experimentation, and careful interpretation of the resultant data provides a reliable basis for the determination and evaluation of new facts by managers" (Ref 25:65).

The Human Behavior School of Management. People and their behavior become the focal point of this school of management thought. Following the lead set forth by Mayo, proponents of this school believe that the welfare and interests of the worker are key elements of increased productivity. Followers of the human behavior school say, "Management does not do; it gets others to do" (Ref 25:65). This type of thinking has done a great deal toward making the work environment more pleasant and enhancing the workers' self-esteem.

Social System School. The social system school, like the human behavior school, deals with the needs of the people. The major difference lies in the fact that the former utilizes the cultural system in which the individual exists and addresses the entire goup or subgroup. Social systems management involves "a system of cultural interrelationships" and deals with (1) the organization, (2) internal and external environment, and (3) forces bringing about change and adjustments (Ref 25:66). The interaction and cooperation of the people making up a social system, in a task oriented situation, are key factors in this type of management.

System Management School. Looking at the "big picture," the system management manager "integrates his available facilities toward goal

achievements by means of systems which relate needed activities required for the end result" (Ref 25:69). A system then is a collection of components which, when properly united, function toward the achievement of some specified goal. An example of how systems management techniques could be applied can be seen in a transportation company. The organization may be made up of warehouses, long and short haul trucks, rail terminals, and air freight terminals and others. While each could function independently of the parent organization, systems management brings together the functions as one entity, seeking one overall goal.

Decisional Management School. Theorists who support the decisional concept believe that decision making is the single most important element of management. Because of this, they seek to train the manager to make the best possible decisions. Decision making does not encompass all that management is and is therefore limited as a complete school of thought, much like the scientific school or the behavior school might be.

Quantitative Measurement School. A companion to the decisional school, the quantitative school seeks to provide the decision maker information in quantitative form--mathematical symbols, relationships, and measurable data. It attempts to (1) optimize inputs-outputs and (2) utilize mathematical models. The quantitative school suffers from the same shortcomings as does the decisional school, plus the significant fact that much management information cannot be quantified.

Management Process School. One philosophy which does appear to address the whole of management is the management process school. The process involved is actually the execution of the basic managerial functions discussed in the opening paragraphs of this chapter--planning, organizing, actuating, controlling, or combinations of similar terms.

Terry believes that ". . . the fundamental functions . . . are basic and are performed by the manager, regardless of the type of enterprise, the major activity, or the level at which the manager works" (Ref 25:87).

Given different organizational needs, any one of these management schools, or others not presented here, may be the most applicable. Of those presented, however, only the last, the management process school, claims to be descriptive of management in a universal sense. The others address only a specialized segment of the overall management picture. These schools should not be underrated because they provide essential information and knowledge about the management process and are useful aids to the manager. To help unify management theory, Terry proposes a modified process management school in which process management is central and the others work to supplement and complement that school. He also illustrates these relationships in Figure 1. To apply the modified process to a system management situation, Terry suggests that his theory be applied to each individual element of the system as if each were a separate situation and then combine the results to achieve the overall objective (Ref 25:94).

Max D. Richards also proposes that the many schools of management converge around basic management functions. Richards uses planning, control, organizing, motivating, and staffing as typical functions of management that pervade all management theory. The major difference in Richards' application is that he offers four basic management systems instead of one theory of management. Which form to use is based upon a combination of uncertainty and complexity. The systems are "(1) a relatively simple line management system, (2) a bureaucratic system, (3) a line and staff system, and (4) a project-matrix system" (Ref 25:9). A brief description of each type follows.

The Line Management System. The line management system is characteristically used by those organizations with low levels of both uncertainty and complexity. The overall security and stability of such an organization allow management by a simple line organization.

Bureaucracy. When organizations grow and become more complex, without undue levels of uncertainty, the bureaucracy becomes the dominant form of management. This type of organization maintains staff elements that attempt to identify and deal with variables that may influence the efficient functioning of the unit. Much of the bureaucratic structure is dedicated to the maintenance of the organization. Very large businesses and governmental agencies tend to be bureaucratic in nature.

The Line and Staff System. An organization using this type of management structure is not faced with the complexities that face the bureaucracy. The staff elements are therefore maintained to deal with a higher level of uncertainty in factors affecting its operations. These staff groups are subcomponents "whose function is research upon variation rather than upon increasing routenization as is the case for bureaucratic staff" (Ref 22:12). To deal with uncertainty is not the primary task of the line and staff organization, but a means of providing security for primary line operations.

The Project-Matrix System. When an organization is faced with large amounts of uncertainty and large amounts of complexity, neither the bureaucracy nor the line and staff organization alone are adequate to meet the challenge. The project-matrix form of management has as its principle charter the dealing with uncertainty in a highly complex area. Due to the applicability of this form of management to the acquisition process, it will be discussed in more detail in a subsequent portion of this chapter.

Throughout all four types of management theory, Richards proclaims the applicability of the basic managerial functions: planning, control, organizing, motivating, and staffing. The types of management and basic functions are effectively brought together in Table 1, where their interrelations with uncertainty and complexity can easily be seen. While these functions exist throughout management, the choice of which management system should be utilized is dependent upon the characteristics of the organization involved, and may involve various combinations of the four basic types.

Project Management

Certainly the acquisition process for any Department of Defense weapon systems is filled with uncertainty and complexity. Because of the nature of the work, project-matrix management has become the mainstay of systems acquisition. The remainder of this chapter on management will be devoted to outlining project management and how it functions.

Most authorities agree when attempting to define project management, and certain major elements dominate their definitions. These include an objective or end result that is difficult or complex, a limited time period in which to achieve the objective, and the requirement to use resources from more than one functional area of the organization. Perhaps one of the most straightforward definitions has been offered by Silverman:

> Project management is the directing and controlling of a relatively short-term project or systems-oriented organization with functional personnel assigned as required and established for the completion of specific goals (Ref 24:15).

This definition includes directing and controlling. Planning, staffing, and organizing could also be added without changing the essence of project management. All functional elements of management are present in project elements.

TABLE 1 (Ref 22:10)

CHARACTERISTICS OF ALTERNATIVE MANAGEMENT SYSTEMS AS INFLUENCED BY UNCERTAINTY AND COMPLEXITY

Degree of Uncertainty in Decision Factors: Low → High

Degree of Complexity in Decision Factors: Low → High

	Simple Line Management Systems	Line and Staff Systems
Planning:	Short-term; future is like past	Need to forecast time related variability for plans
Control:	Specific, short-term feedback	Long interval feedback on some factors
Organizing:	Few staffs; high rationalization of tasks possible but inconsistent with human needs.	Staff to research variability; organizational change frequent
Motivating:	Human relations orientation needed to overcome boredom and lack of task challenge.	Consultative approach
Staffing:	Workers with needs for certainty and acceptance of routine is helpful	Those comfortable with some degree of uncertainty and change
	Bureaucratic Systems	**Project or Project-Matrix Systems**
Planning:	Need to account for many inter-related factors; short-term	Uncertainty and ignorance requires research
Control:	Partially summarized key measures	Overall rather than specific accomplishment judgments
Organizing:	Staffs for routinization; stable complex structure	Each project requires unique combination of talents and organizational structure
Motivating:	Human relations orientation as in simple structure	Authoritarianism inappropriate; team building while providing structure to those needing certainty
Staffing:	Tolerance for many constraints, rules, procedures, stability, and complexity	Tolerance for ambiguity, long term payoffs, and frequent changes in assignments are helpful

Another approach to defining project management is to first identify what a project is, and then that process that brings it about. Again, going to Silverman for a definition, " a project is an organization designed to accomplish a specific achievement. It is created from within a functioning parent organization and dissolved upon completion of that achievement" (Ref 24:9). The management of a project involves its direction and supervision. The temporary nature of the project is addressed in this definition and Silverman goes on to state that it is increased complexity that differentiates the effort from one that can be fulfilled within the functional organization to one that requires special project emphasis (Ref 24:15).

There exist a number of circumstances in which project management is appropriate. Among those are:

1. A single, specific end product.
2. A high degree of unfamiliarity.
3. A high degree of interrelatedness between functional elements.
4. Organizational reputation--if a lot is at stake, a project is necessary.
5. "A multilateral objective exists, toward which many people and many relatively independent organizations work together" (Ref 10:201).
6. "Project integration requires the concurrent contribution by two or more functional elements and (or) independent organizations" (Ref 10:201).

Once general management has identified the need for "projectization" of an effort, a project manager is selected to head the organization. The project manager becomes the focal point for all project operations and is the key element of the project organization. The project manager is responsible for coordinating the efforts of all functional elements to

accomplish the established goals. The project manager's authority consists of that given to him by general management and should extend far enough to direct all members and organizations in the project team (Ref 19:21). No project manager can expect success without the support of top management. As Martin states, "It takes direct personal signals from the top executive to the other top members of the team to convey the message that the project will succeed, and that all members of the team will be measured by its success" (Ref 19:32). Additionally, the project manager must be well versed in the operations of the functional elements and with the operations of any contributors external to the organization that interact upon the project. It becomes apparent that the project manager is the key individual in such an operation. In a situation where multiple projects exist, a manager of projects may be designated to coordinate project efforts.

The basic management design of any project effort is the matrix organization. The essence of matrix organization is the purposeful crossing of functional lines of authority in order to fulfill project needs. Newman and Warren explain the functions of the matrix by saying that "Matrix organization strives to (1) ensure the coordinated, focused attention that such projects require and (2) retain at the same time the benefits of specialized expertise and capabilities that only functional departments can provide" (Ref 21:92). Because of the time-consuming nature of following functional lines of authority in project situations, the project manager must often rely upon his personal leadership and the challenge of the job to get things accomplished. An overview of how a project organization compares to a functional organization is provided in Table 2.

TABLE 2 (Ref 11)

Comparison of the Functional and the Project Viewpoints

Phenomena	Project viewpoint	Functional viewpoint
Line-staff organizational dichotomy	Vestiges of the hierarchical model remain, but line functions are placed in a support position. A web of authority and responsibility relationships exists.	Line functions have direct responsibility for accomplishing the objectives; line commands, and staff advises.
Scalar principle	Elements of the vertical chain exist, but prime emphasis is placed on horizontal and diagonal work flow. Important business is conducted as the legitimacy of the task requires.	The chain of authority relationships is from superior to subordinate throughout the organization. Central, crucial, and important business is conducted up and down the vertical hierarchy.
Superior-subordinate relationship	Peer-to-peer, manager-to-technical-expert, associate-to-associate, etc., relationships are used to conduct much of the salient business.	This is the most important relationship; if kept healthy, success will follow. All important business is conducted through a pyramiding structure of superiors and subordinates.
Organizational objectives	Management of a project becomes a joint venture of many relatively independent organizations. Thus, the objective becomes multilateral.	Organizational objectives are sought by the parent unit (an assembly of suborganizations) working within its environment. The objective is unilateral.
Unity of direction	The project manager manages across functional and organizational lines to accomplish a common interorganizational objective.	The general manager acts as the one head for a group of activities having the same plan.
Parity of authority and responsibility	Considerable opportunity exists for the project manager's responsibility to exceed his authority. Support people are often responsible to other managers (functional) for pay, performance reports, promotions, etc.	Consistent with functional management; the integrity of the superior-subordinate relationship is maintained through functional authority and advisory staff services.
Time duration	The project (and hence the organization) is finite in duration.	Tends to perpetuate itself to provide continuing facilitative support.

The major obstacle for the modern manager to overcome is not finding guidance for his work, but choosing the appropriate material to use in a given situation. This chapter has been an attempt to illustrate the diversity of managerial guidance and will provide a basic reference for subsequent chapters.

IV. SITE ACTIVATION: A MANAGEMENT PLAN

In attempting to develop a management philosophy for aeronautical weapon system site activation, it would be difficult to identify any activity that could stand alone without any external interaction. The site activation process is no exception. To simplify the development of a management technique for multiple site activations, two major interaction areas will be considered. The first is the impact of the activation process within the SPO (intra-SPO) and the relationship generated by this interaction. While an activation activity is maintained as a part of the SPO and may even constitute an organizational element of the SPO, the second interaction area involves bringing together the SPO and all external elements necessary to place the first new aircraft in operational status (inter-SPO). This breakdown by inter- and intra-SPO will be maintained throughout this chapter to add greater visibility to the problems generated in site activation.

The first consideration in developing a management plan for site activation is to consider what has been done in the past. In his thesis, Abrams commented that the site activation process was suited to project management, committee management, and task force management (Ref 1:92). More recently, he commented that committee management might be the key to such an operation (Ref 2). In considering committee management, many attributes surface. Some of the reasons to utilize committee action follow:

1. A committee is desirable when it is expected that the recommendations of a coordinated group will be better than those of an individual.
2. When knowledge derived from different specialties is needed, a committee may be the best approach.

3. A committee is useful when continuing coordination is needed between different segments of the enterprise.

4. When a problem calls for a wide airing in order to promote awareness throughout the organization, publicity connected with the appointment of a committee, its operations, and findings often can help meet this broad-based objective.

5. Committees can be effective in settling jurisdictional questions since participants can express differing points of view and jointly formulate and implement results.

6. When authority is divided in an organization so that no one manager can take necessary action, a group may consolidate its members' individual authorities to allow action to be taken without going to higher executives for approval (Ref 13).

The positive effects of committee management are reflected strongly in the SATAF meetings of previous site activation efforts. Because of this, the principles of committee management are a valuable asset in the activation process. However, the SATAF meeting is only a small portion of the overall deployment effort. A great deal of planning and activity takes place within the SPO and the other functional agencies prior to and following the formal SATAF events. For these reasons, committee management may be utilized within the activation process but cannot be considered as an overall management form for that process.

The organizational task force holds greater promise. Galbraith says this about a task force:

> The task force is made up of representatives from each of the affected departments. Some are full-time members; others may be part-time. The task force is a temporary group. It exists only as long as the problem remains. When a solution is reached each participant returns to his or her normal tasks (Ref 14:116).

Here are things that have a familiar ring in past activation activities. Instead of dealing with different departments, site activation involves the interaction of functional groups from other commands and organizations

external to the project office. The task force may be fairly representative of the site activation task force (SATAF), but the activation process involves considerably more than formal SATAF activities. According to Galbraith, the task force organization is developed "in addition to" basic organizational structure and "not instead of" that structure (Ref 14:194). From this, it can be assumed that the task force is designed as a trouble shooting element and does not have the long-term maintenance capabilities to handle a more complex activity like site activation.

The difference between a task force and a project activity is not great. A project makes provision for organization maintenance by retaining, within itself, a minimum number of resources for operation. These might include personnel, finance, administration services, and others. Project management may be the most appropriate managerial instrument to handle the site activation problem.

In retrospect, it can be shown that site activation meets a large number of the circumstances that call for project management as discussed in Chapter Three.

1. There is a single specific end product--the activation of a specific site.
2. Each site involves a degree of unfamiliarity due to the uniqueness of that site and its physical properties.
3. The functional elements must work closely together to insure that the weapon system will be ready on schedule.
4. Organizational reputation plays a minor role but is still a factor because the success of any acquisition effort is achieved only when the weapon system becomes operational.
5. Relatively independent organizations, in the form of Air Force commands and contractors, are working together to achieve the objective.
6. Many functional elements and independent organizations are drawn together to activate a site (Ref 10:201).

In addition to these six circumstances, Cleland and King itemize a number of characteristics that depict a project environment. These are:

1. The [project] manager operates independently of the normal chain of command.
2. The manager negotiates directly for support from functional elements.
3. The manager functions as a single point of contact.
4. The organizational life of a project tends to be finite.
5. A deliberate conflict exists between the project and the functional sections involving competition for time and talents.
6. A project involves more than one subdivision of the organization.
7. A project can originate from anywhere in the company.
8. The project cannot be carried out totally within one division or functional element.
9. An individual is needed to assume total responsibility and accountability for the project success (or failure) (Ref 10:204).

The review of past site activations indicates these characteristics have been present in both the F-15 and A-10 site activations. While the qualities of committee and task force management could be incorporated within the structure of a project organization, only a project can fill all the requirements of a site activation effort.

With the entire acquisition process within DOD moving toward a project form of management, it is not surprising to find that site activation has developed in the same manner. Project management is not without its problems, however. Martin points out that, "The central ideas of project management are simple and direct. Unfortunately, in the early and mid-sixties, an excessively complex implementation of its techniques by the Department of Defense, which forced the complexity on the contractors,

caused many executives to regard project management as unsuitable for commercial undertakings and therefore to shy away from it" (Ref 19:v). This skepticism still exists in varying degrees, both in Department of Defense and contractor agencies.

One of the largest complaints about project management concerns the type and amount of authority vested in the manager of the project. To better understand the reasons for this confusion, some differences between functional and project management must be reviewed. Pure project management sits at the opposite end of a management spectrum from functional management. It contains all elements or resources necessary to produce the end product. Functional management, on the other hand, places only one resource in each division and that division is responsible for all of that resource. On the spectrum between these two extremes lies matrix management. Matrix management allows the project manager to maintain only those resources necessary at a given time, borrowing others from the functional structure as necessary. While this has the advantage of reducing the overall total number of resources maintained at any given time, it presents sizeable problems in authority definition. In a matrix organization, it becomes possible for an individual to fall under the formal authority lines of two, or more, supervisors. These include the functional manager and as many project managers as utilize his services.

The manager of site activations in the past has been the focal point for that activity, and the amount and type of authority that he has available is important to the completion of the task at hand. This authority generally takes two forms: (1) legal authority and (2) earned or personal authority. Archibald suggests that legal authority stems from such things as organization charter, job specifications, executive rank, policy document,

the hierarchal flow and the control of funds, while earned or personal authority grows from technical and organizational knowledge, management experience, maintenance of rapport, the projects manager's focal position, and negotiation with peers and associates (Ref 4:42). The establishment of the site activation manager's authority within the systems project office can come about by a straightforward decree from the program director, a policy letter, organizational position, etc. As with any project internal to a program office, the director of that office can allow the project manager authority commensurate with the need based upon priority, timing, cost or whatever is important at a given time.

Legal authority for the site activation project outside the project office is not as simple. Only at the Headquarters Air Force level can an organizational position be found that can maintain formal military authority over all participants in the site activation program. Such a project does not normally require this high level of attention, making it necessary to use other means of gaining authority. Tools like organizational charters, policy documents, and delegated power (provided there is agreement by all participants) are used to maintain legal authority outside the SPO environment.

The real emphasis of authority of any matrixed organization must come from the earned authority list. Newman and Warren state:

> To draw the best from his group, the project manager must . . . rely on both the challenge of the job and on his personal leadership. Because of this heavy reliance on voluntary cooperation, project teams work best on projects for which the quality of the finished product or service, its deadline, and its costs are clearly specified (Ref 21:93).

It could be added that if these goals are also agreed upon as important to all participants, the task of the project manager becomes much easier. These things are particularly true in activities outside the SPO, where

legal authority is minimal or may be lacking completely. In past activations, project managers have relied heavily upon such things as the project manager's focal position, peer negotiations, rapport, and management experience to guide successful activation efforts (Ref 3, 5).

Within the SPO organization, the site activation manager utilizes earned and personal authority, but is not so completely dependent upon it as he is outside his own organization. The ability of the project manager to develop earned or personal authority generally allows him to function with less resistance and greater efficiency within the project office.

Newman and Warren proposed one solution that has some merit. They say that authority problems can be resolved by appointing "a project manager for each clear-cut mission and then to assign from each of the functional departments the talent needed to complete the mission" (Ref 21:93). While the functional elements work on a given project, they are subservient only to the project manager. This relationship is illustrated in Figure 2.

Within the Aeronautical Systems Division of Air Force Systems Command the matrixing of functional resources takes two different forms. Some are actually co-located in the program office and devote 100% of their time, the remainder being spent on different projects. For those individuals co-located in a project organization, what Newman and Warren suggest seems applicable. For the other, a higher reliance on earned or personal authority is necessary to efficiently achieve the desired goals.

Management for Multiple Activations

With an acceptance of the applicability of project management for site activation, the development of management techniques for multiple activation can be pursued. Consider initially the activation of a

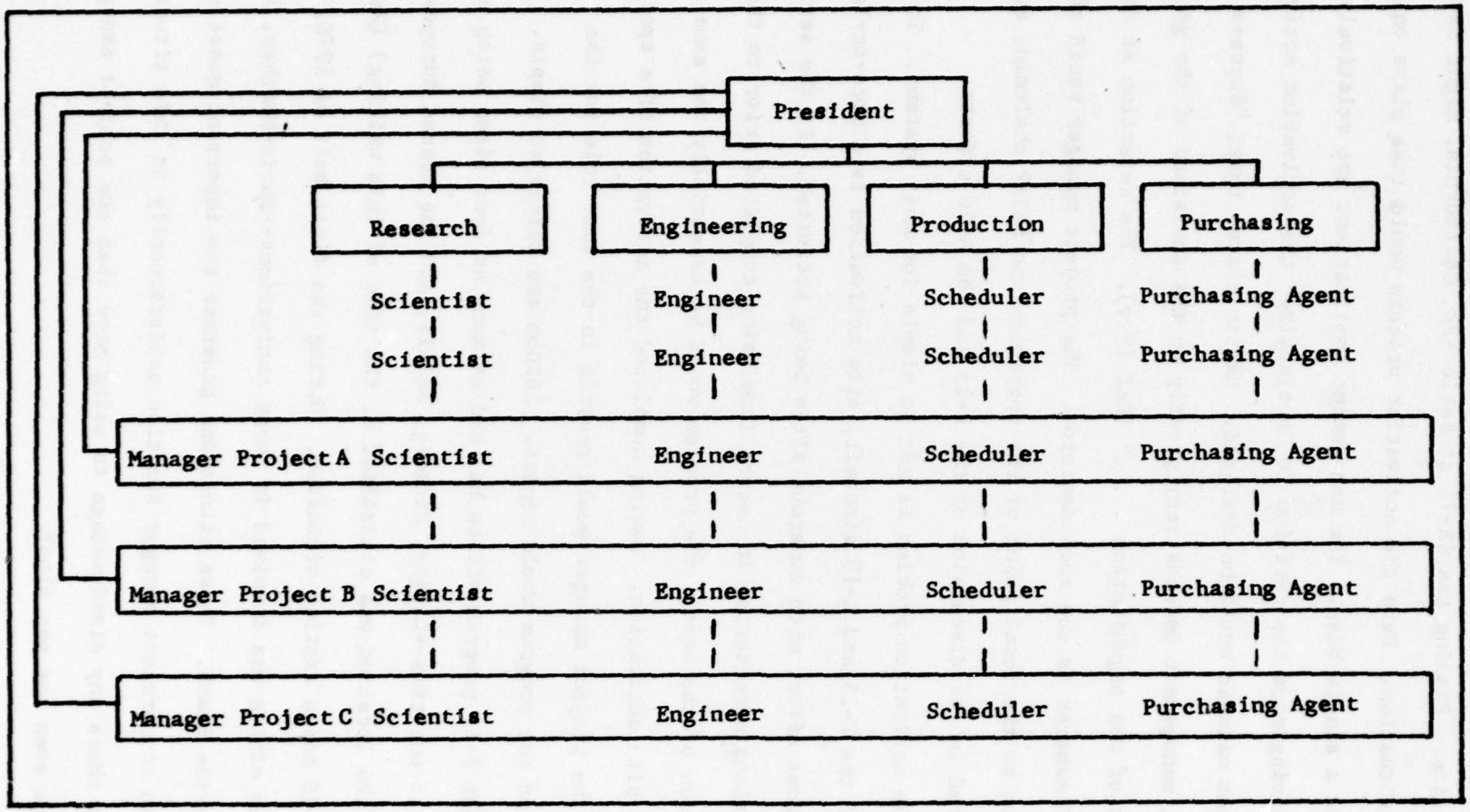

Figure 2. Matrix Organization (Ref 21:94)

single site. Placing the SR-71 at Beale AFB, California, might have been such a situation. Here the activation process would take place only one time, at a single base. The management implications are relatively simple. After having made the decision to "projectize" the activation activity, a project manager would be assigned. Martin states that, "Success in project management depends very greatly on the decisions of the general manager of the organization . . ." (Ref 19:v). The selection of the project manager is one such decision. The project manager would then function as the focal point of the operation and SATAF chairman, much as described in the discussion of the F-15 and the A-10 efforts.

The activation problem is not so simple for most systems. In the case of the F-15 and A-10 aircraft, site activation is a more-or-less continuous effort with numerous sites being activated. If the series of activations were serial in nature (one being completed prior to the inception of the next), the problem would be essentially the same as the single site activation. Having completed the activation of a specific site, the project manager would recycle in the same role for the next site and the program would repeat. Seldom are things so simple.

The F-15 program office has had as many as four sites being activated at one time--Langly, Bitberg, Nellis, and the second European site (the location was classified at the time of this writing) (Ref 3). The A-10 has a similar situation. During the first half of 1976, the program office was involved in three activations--Davis-Monthan, Nellis, and Myrtle Beach. These situations generate two important questions: (1) Can one project manager function satisfactorily in this situation? (2) Is there any disadvantage to using more than one project manager, perhaps even one per site?

In response to question one above, it should be noted that no two (or more) sites have been activated at exactly the same point in time. In referencing the diversity of projects within an organization, Cleland and King stated the "at any given time each of these projects will typically be in a different phase of its life cycle. For instance, one product may be in the conceptual phase, some are being produced, and some are being phased out in favor of oncoming models" (Ref 10:192). In the case of site activation, the life cycle begins with initial intra-SPO planning and follows with (among others) SATAF formation and initial meeting, training and facilities preparation, spares delivery, and aircraft delivery. A graphic illustration is shown in Figure 3. The timing of these activities is such that management interest forms a curve skewed toward the completion of the project time period and the delivery of the first aircraft. Because the aircraft delivery date for each site differs, the alignment of the life cycle curves is such that peak interests fall in different time spans (see Figure 4). This has allowed the F-15 and A-10 program offices to retain one site activation project manager, even though segments of several activations occur at one time. The answer to question one appears to be yes, given a situation where three or four site activation efforts overlap.

If manpower is not a limiting factor, it may still be advantageous to abandon the single manager concept. In answering question number two, one important factor appears to weigh heavily in favor of having one project manager for the entire activation effort. The manager of any project is the focal point of knowledge and information and as such, has the potential of becoming a highly valuable corporate memory for that process. Such has been the case for both the F-15 and the A-10 (Ref 3, 5).

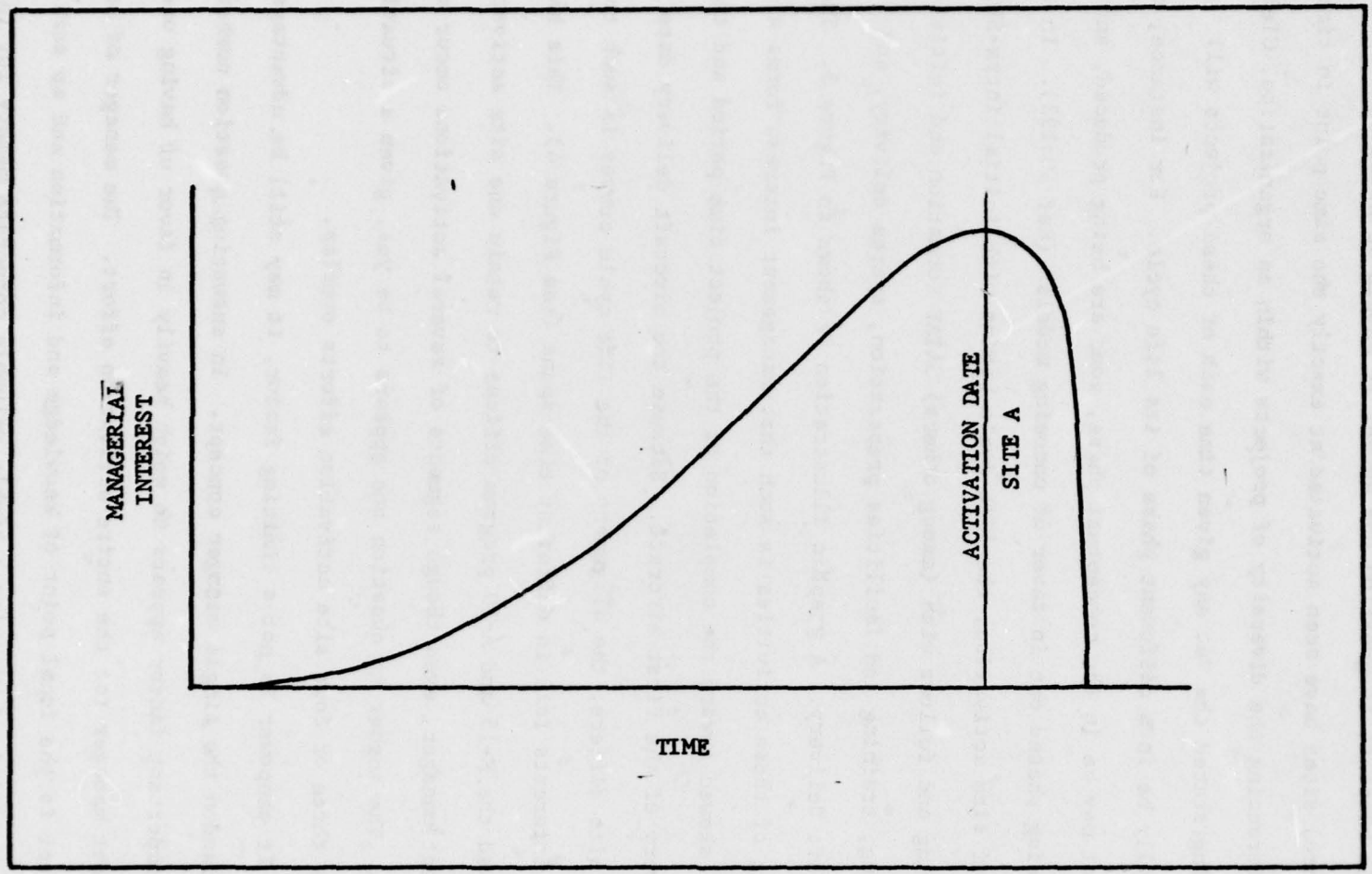

Figure 3. Single Managerial Interest - Time Curve

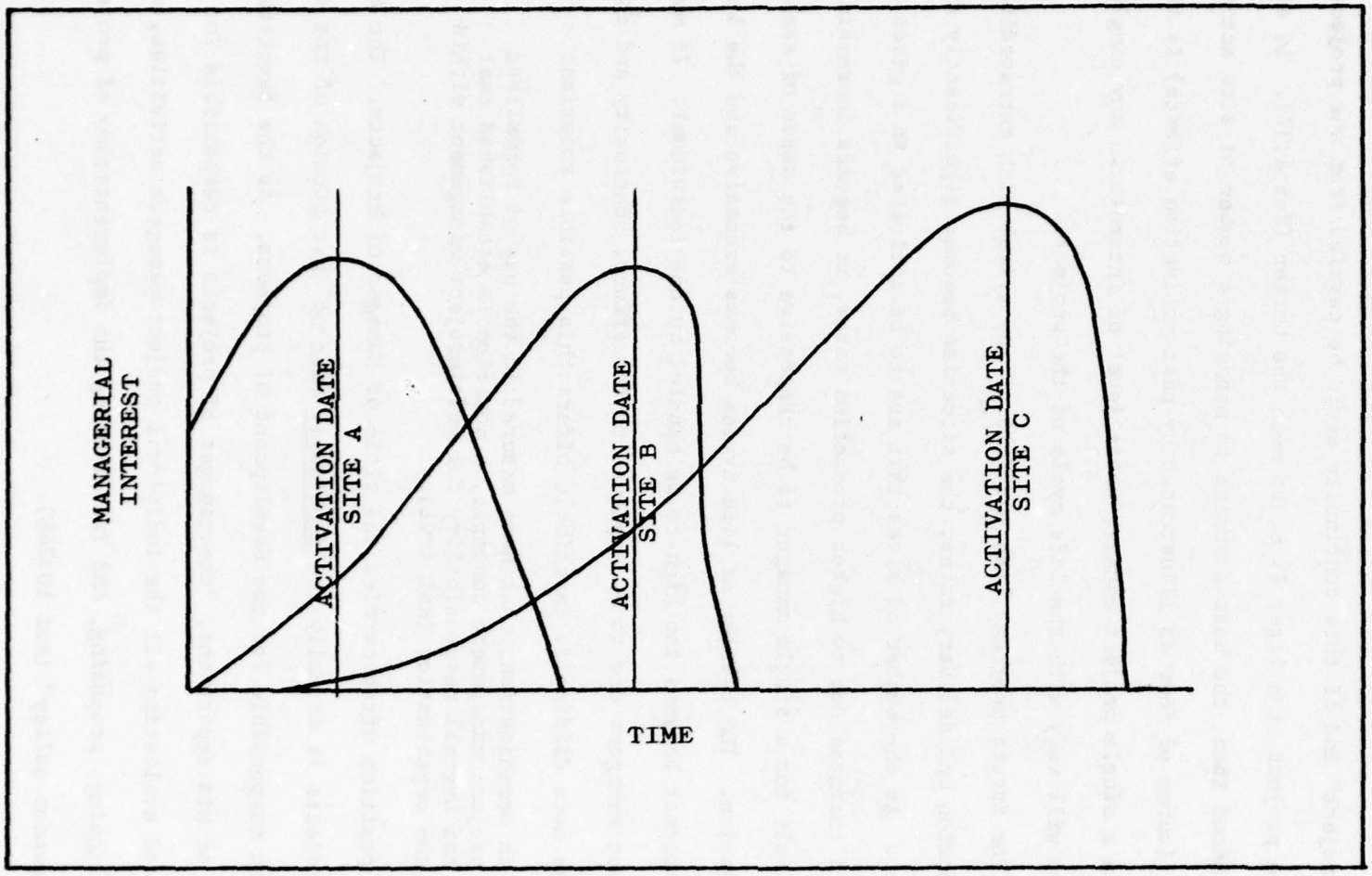

Figure 4. Multiple Managerial Interest - Time Curve

Archibald stated that "the effectiveness of a project manager is directly related to the continuity of his responsibility through the life cycle of the project" and if this continuity could be carried from one project to a like project at a later date, so much the better (Ref 4:37). In all likelihood then, the best approach to managing a number of site activations (three or four as illustrated by past activation efforts) is to retain a single project manager whose level of interest in any single effort will vary with the life cycle of the project.

For future programs like the F-16 or any system with extraordinary production and delivery rates, the situation becomes significantly different. As the number of sites that are to be activated in a given time period increase due to higher production rates, it becomes increasingly difficult for a single manager to be responsive to the needs of each activation. The overlap of life cycles becomes excessive and the level of interest becomes too high to be handled by one individual. If more project managers are to be assigned to the effort, continuity and control become more difficult. Archibald offers this possible solution:

> In organizations that have matured in the use of formalized project management concepts, a position is established that has overall responsibility for multiproject management within the organization (Ref 4:41).

This position often carries the title of Manager of Projects. The Manager of Projects is actually the <u>functional</u> head of that portion of the organization responsible for the development of projects. As the functional head of his department, "the manager of projects is responsible for directing and evaluating all the individual project manager's activities, as well as planning, proposing, and facilitating the implementation of project management policy" (Ref 10:248).

The position of manager of projects might fall into an organizational chart as illustrated by Figure 5. For site activation projects, the individual site managers could be as numerous as one for each site, with a single manager of projects placed in a supervisory position for all sites. By using such an arrangement, the program office could utilize as many project managers as necessary, dependent upon the number of sites being activated and their overlap, and maintain overall project continuity through the manager of projects. The objectives of such a multiproject organization, and more specifically the manager of projects, would be:

1. Completion of all projects to best achieve the overall goal of the deployment effort.
2. Determination of both long-term and short-range priorities.
3. Acquiring and maintaining an adequate supply of resources for all activation efforts.
4. Integrating requirements between individual activation efforts.
5. "Developing organizational patterns and management systems to satisfy the ever-changing needs on one hand, and to provide . . . organizational stability, professional development, and administrative efficiency for persons managing and supporting various projects" (Ref 4:60).

Program management has come of age in the acquisition processes of the Department of Defense. The management of individual projects within this organizational framework is a natural spin-off and is gaining approval in governmental and industrial circles. Martin states, "The success of project management in the Department of Defense, and the recognition that it is the only practicable way to bring off some complex projects, has led to its extensions in the federal government. The Departments of Transportation and of Housing and Urban Development are among successful users of project management" (Ref 19:4). As an extension of simple project management, multi-project management could be easily adapted to activities like weapons system site activation where the number of simultaneous activations becomes very large.

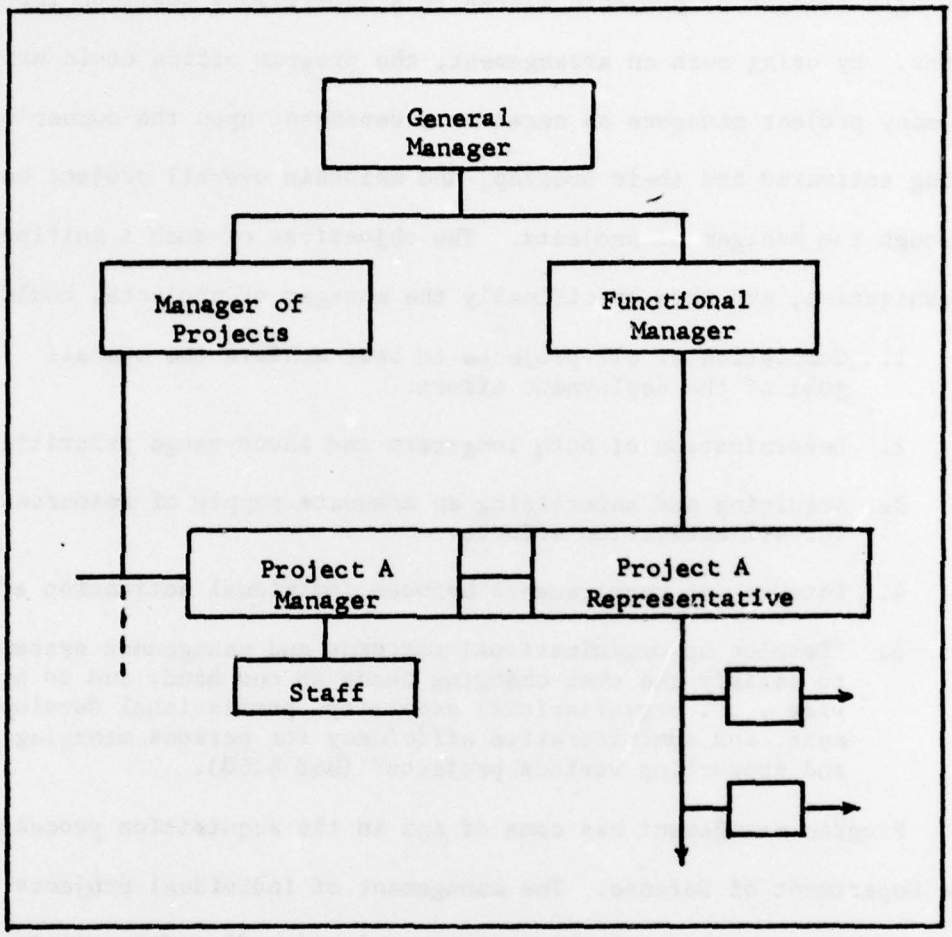

Figure 5. Matrix Relationships (Ref 9:347)

Management of F-16 Site Activation

The F-16 site activation program began like other programs. Those assigned the responsibility of developing the site activation process for the F-16 turned to traditional sources for information--the appropriate regulations and past site activation efforts. The utilization of organizational regulations developed much like the F-15 or A-10 systems with a strong dependence upon the Air Force and Air Force Systems Command/ Air Force Logistics Command 800 series regulations. From the general guidance of the regulations, the F-16 project office turned to the earlier experiences of the F-15 and A-10 program office for more detailed guidance.

The early stages of deployment planning were accomplished within the F-16 Directorate for Test and Evaluation. This arrangement was prompted by the fact that the first aircraft to be deployed were to serve test and evaluation functions. The deployment project officer during these early activities was Major Claude Kincade, who functioned in this capacity part-time while fulfilling other test and evaluation duties. An interview with Kincade revealed an early dependence upon the F-15 deployment program for guidance and advice. Discussions with Abrams and copies of this thesis provided much of the practical guidance used by Kincade (Ref 16). Because of this, the development of the F-16 deployment effort closely paralleled that of the F-15.

One exception to the similarity of the F-16 and F-15 deployments came about as the result of proposed high production rates. Because of this, early drafts of the F-16 deployment master plan indicated that the deployment effort would be supported by an independent division of the Test and Evaluation Directorate. The role of the chief of this division was defined in that early proposal:

> The Deployment Division Chief, as deployment manager, will be responsible to the SPD [Systems Program Director] for full coordination of integrated system activation efforts with the logistics, operations training, and test milestones . . . He will appoint SPO site managers for each site designated by the SPD (Ref 33:2-4).

From this definition, the primary role of the Deployment Division Chief is that of a manager of projects, while the site managers are the project managers. The individual projects would exist of the activation of each unique site.

As pointed out, however, these developments were reflected in early draft writings and do not indicate the present structure. Based upon the high level of interest in the F-16 project and the high number of bases to be activated--including United States Air Force, European Participating Governments, and Foreign Military Sales sites--General James A. Abramson decided to elevate the structure of the deployment effort to that of a directorate. This placed the deployment activity on the same level as Test and Evaluation, Multinational Programs, Projects, Configuration Management, and other directorates, all falling directly under the control of the program director. While this does not alter the relationships described concerning the manager of projects and the project managers, it does elevate the organizational structure to a point where it closely parallels that illustrated by Cleland and King in Figure 5. In this perspective the program director functions as the general manager, the Directorate of Deployment Chief is the manager of projects, and the individual site managers are the project managers.

The concept of the Site Activation Task Force has been retained in the F-16 site activation program. The site manager for each site acts as the SATAF manager for that site while the directorate chief, and other SPO personnel involved in the SATAF, provide the necessary continuity

between individual SATAF efforts. After completing his SATAF responsibilities, the site manager functions as the SPO Liaison Officer to the site being activated. His function in this role is to continue the continuity of SPO involvement with that individual site.

Another vestige of the F-15 and A-10 efforts remains with the F-16, but only as a potential. This is the General Officer Steering Group. While the F-16 Deployment Master Plan provides for a GOSG, there is no intent, at this time, to actually form the group (Ref 15). The GOSG is one means of providing a formal authority source over the SATAF participants. The F-16 arrangement requires that the deployment manager exercise more earned and personal authority through his site managers to accomplish the task of site activation.

The parallels between the developing F-16 deployment program and the management plan presented earlier in this chapter are ovbious. While the plan offered in this thesis is a product of the mating of history and management theory, the F-16 plan was born out of an environment that is almost wholly project in nature. To have the genesis of two similar plans take place so independently suggests some validity for the plans. Future progress of the F-16 weapon system deployment and other multiple activation programs will eventually verify or reject the workability of such a plan.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Due to the international interest in a high performance, low cost fighter aircraft, the production rate of the F-16 will be higher than any recently produced weapon system. Higher production rates dictate more rapid deployment to operational sites and additional site activation problems. The purpose of this thesis was to analyze some of the problems and evaluate possible management concepts that might help resolve these problems.

The methodology used to accomplish this goal contains three basic elements:

1. An historical overview of past activation management policies.
2. A survey of current management literature with emphasis on project management.
3. A proposed management plan for multiple site activations with the supporting analysis of elements one and two above.

Historically, little was recorded prior to 1974 when Frederic Abrams wrote a thesis addressing overall management concepts for site activation. His effort has become the foundation of an ever-growing corporate memory on site activation. Building upon that foundation, the F-15 and A-10 have added significantly to this documentation and represented typical historical efforts in the present analysis.

The F-15 site activation program was most directly influenced by Abrams inasmuch as he eventually became the officer in charge of that effort. It was in the F-15 program that the Site Activation Task Force concept was first applied to aeronautical weapon systems. Having been highly successful, it would be retained as a part of this and other

activation efforts. The SATAF filled an important role in the deployment by serving as an interagency forum to coordinate the efforts of various Air Force Commands and civilian contractors.

The development of the A-10 program was patterned closely after that of the F-15. Relying on the same regulations used by earlier efforts, plus the experiences of the F-15, there could be little doubt of the similarity of the two efforts. Differences did exist, however, and the most obvious deals with the scheduling of SATAF working group meetings. While the F-15 working groups held their meetings sequentially, those in the A-10 utilized a simultaneous schedule. Other differences existed but were relatively minor in nature.

In order to properly identify what managerial techniques might be applicable to the site activation process, a literature review was conducted of current management publications. The historical inputs of Taylor, Fayol, and others were used to form the background for a number of management schools of thought. Most of the schools deal with only a portion of the management environment and therefore have limited applicability. One exception, the Management Process School, attempted to be descriptive of management in a universal sense. Additionally, Max D. Richard offers four basic management systems that unite to form a universal theory of management. These systems are (1) line management, (2) bureaucracy, (3) line and staff, and (4) project-matrix.

Because of the nature of the acquisition process, project-matrix management has become well-established in the development of aerospace systems. As a result, additional detail of the project-matrix system of management has been provided. Included are definitions and discussions of project and matrix management with some comments on the applicability of these management forms.

In order to effectively bring together management theory and site activation, it was necessary to identify management techniques used in past activation efforts and evaluate these for their potential in future efforts. Committee, task force, and project elements were identified with project management being the most inclusive of the three. The application of project management to both the F-15 and A-10 was discussed with some emphasis on the role of the project manager and an analysis of authority problems.

As a result of the research and analysis performed, a management plan for multiple site activation was proposed. This plan includes conventional project management orientation, with the addition of a multi-project organization, involving a Manager of Projects, in addition to project managers, to provide continuity and overall guidance for the collective project efforts. An overview of the F-16 activation project provides significant parallels to this management plan. A Directorate of Deployment provides the organizational seat for the manager of projects, while the role of project manager is filled by the Site Manager in the F-16 program.

Conclusions and Recommendations

The first and most important conclusion of this effort is that the managerial technology to effectively activate multiple sites at one time is currently available. The project management structures exist to handle multi-project efforts efficiently without radical innovations. The F-16 program office is now developing such a multi-project structure to manage future site activations. This requirement is the result of higher than normal deployment rates.

The applicability of theoretical management knowledge has proven to be directly applicable to satisfying an operational requirement. Often theory and real life appear so dissimilar that the two are difficult to relate to each other. This has not been the case in this research. Theoretical foundations have been easily built under real life problems.

A second, unsolicited conclusion has presented itself as a result of this effort. A pattern of development has appeared in the establishment of site activation programs that has emphasized a review of how past weapon systems have pursued the activation problem. The reliance upon the corporate memory of past activation has proven effective in producing more efficient efforts in subsequent deployments.

This observation highlights a very important fact--it is essential that programs like site activation maintain some form of historical documentation including lessons learned. Prior to 1974, such a record did not exist. Thanks to the efforts of the F-15 and A-10 programs, follow-on systems like the F-16 are having less difficulty in forming their own programs. It is hoped that this thesis effort will also add to the corporate memory of site activation and that such research and documentation will continue to facilitate future deployment efforts.

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VITA

Captain Michael D. Hite was born 9 August 1948 in Lebanon, Missouri, where he spent his youth. After graduating from Lebanon High School, he attended the United States Air Force Academy through June of 1971. Upon graduation, he received a Bachelor of Science degree in psychology and a Regular Commission as a second lieutenant.

Captain Hite was first assigned to the 47th Training Squadron, Laughlin Air Force Base, where he attended pilot training and later became a flight and academic instructor. In September 1975, Captain Hite was assigned to the 47th Organizational Maintenance Squadron, where he served as an administrative officer for one year.

Captain Hite is currently assigned to the School of Engineering, Air Force Institute of Technology, where he is pursuing a Master of Science degree in Systems Management.

Permanent address: Route 2, Box 163
Richland, Missouri 65556

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With the development of the F-16 and other low cost, high production weapon systems, the need to activate higher numbers of sites at one time becomes a reality. It also generates new management problems. An historical examination of past activation efforts, primarily the F-15 and A-10, was combined with a review of current management literature to evaluate the problems. A project management structure is proposed to handle simultaneous activation. This structure is similar to those of past systems, but with the

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addition of another level of management to supervise the overall activation effort. The "Manager of Projects" role has been filled in the F-16 effort by the Director of Deployment. While the F-16 program seems successful, complete validation can come only when the F-16 effort is concluded.